BATTERY-POWERED WASHER

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention relates to a hand-held washing unit which includes an elongate wand for holding by the user, with a brush on the end of the unit for assisting in the cleaning of objects, particularly useful for cleaning automobiles.

Discussion of the Prior Art

[0002] Many types of devices exist for cleaning objects such as automobiles, most of which include an elongate wand which is a conduit for receiving water therethrough. At the upper end of the wand is a hose bib for connection with a hose and at the opposite and lower end, a stationary brush which receives water therethrough. Some devices are designed such that a soap tablet can be positioned within the brush such that upon application of water, soap foam is produced through the brush for cleaning purposes. These designs have two inherent shortcomings. Firstly, due to the stationary brush, the user must exert great energy in the cleaning of an automobile to remove imbedded dirt, tar and the like. Secondly, as the water comes through the brush and forms the soap foam, the brush must be disconnected from the hose in order that the automobile can be rinsed with clean water.

[0003] Another type of design is shown in U.S. Patent 5,289,605 to Armbruster, which anticipates a rotary brush driven by a DC battery. In this design, the brush anticipates that the motor wiring is brought through the elongate handle, and is connected to a battery pack which the user wears. This design is somewhat cumbersome and difficult to use and has an inherent design problem as it relates to the wiring coming through the elongate handle, as the elongate handle must extend and contract for the user as well as for the object to be cleaned.

[0004] These and other shortcomings of the prior existing designs have been accomplished by the below-described invention.

SUMMARY OF THE INVENTION

[0005] The objects of the invention have been accomplished by providing a hand held washing unit comprising a motor drive unit comprising a housing having an upper

battery receiving cavity and a lower motor receiving cavity, a motor received in the lower cavity, electrical contacts positioned within the upper cavity being electrically connected to the motor, a linkage drivingly connected to the motor, and an output drive member connected to the linkage; an elongate handle connected to the motor drive unit for grasping while in use; a battery pack receivable in the upper cavity, the battery pack having a housing for receipt of at least one battery, the battery being electrically connected to battery contacts external of the housing, the battery being in alignment with the motor contacts; and a switch interconnected between the battery and motor, for switching power between the battery and motor; whereby, upon installation of the battery pack into the upper cavity, the battery contacts electrically engage the motor contacts, electrically interconnecting the battery to the motor.

[0006] Preferably, the motor drive axis and the output drive member are aligned along a common axis. The upper cavity is in alignment with the common axis, such that the battery is installed along the common axis. The battery pack includes a plurality of serially connected batteries connected at opposite poles to the battery contacts. The battery pack is comprised of a bi-partite housing comprising an upper housing and lower housing, the bi-partite housing including battery positioning walls therein, and three batteries positioned therein. The switch is preferably intermediate the serial connection, and is installed in the battery pack. The battery pack is comprised of a housing member having an upper and lower surface, the battery contacts being positioned on the lower surface, and being receivable within the upper cavity, the switch being positioned within the switch housing member, the battery pack further comprising an actuator for the switch, the actuator extending through the upper surface of the housing member. The switch includes a full power position and a partial power position, the partial power position having silicon rectifier diodes in series therewith, for controlling the voltage drop.

[0007] In another aspect of he invention, a hand held washing unit comprises a motor drive unit comprising, a housing having a lower drive train receiving cavity, a drive train positioned within the receiving cavity, the drive train comprising a motor positioned in and held by a gear casing, the gear casing having gear teeth on an inner periphery thereof, and a planetary gear assembly positioned within the gear casing and driven by the motor, the planetary gear assembly having an output drive shaft, a brush for connection with the output drive shaft, an elongate handle connected to the motor drive unit for

grasping while in use, and a battery assembly for connection with the motor for driving the motor.

[0008] Preferably, the planetary assembly is comprised of a double planetary gear set. The motor drive unit is further comprised of a housing having an upper battery receiving cavity and a lower receiving cavity, the motor and planetary gear assembly positioned in the lower cavity, and electrical contacts positioned within the upper cavity being electrically connected to the motor. The battery assembly is comprised of a battery pack receivable in the upper cavity, the battery pack having a housing for receipt of at least one battery, the battery being electrically connected to battery contacts external of the housing, the battery being in alignment with the motor contacts. The battery pack includes a plurality of serially connected batteries connected at opposite poles to the battery contacts. The battery pack is comprised of a bi-partite housing comprising an upper housing and lower housing, the bi-partite housing including battery positioning walls therein, and three batteries positioned therein. The switch is intermediate the serial connection. The switch is installed in the battery pack. The battery pack is comprised of a housing member having an upper and lower surface, the battery contacts being positioned on the lower surface, and being receivable within the upper cavity, the switch being positioned within the switch housing member, the battery pack further comprising an actuator for the switch, the actuator extending through the upper surface of the housing member. The switch includes a full power position and a partial power position, the partial power position having silicon rectifier diodes in series therewith, for controlling the voltage drop.

[0009] In yet another aspect of the invention, a hand held washing unit comprising, a motor drive unit comprising a housing having a lower motor receiving cavity, a motor received in the lower cavity, a linkage drivingly connected to the motor, an output drive member connected to the linkage; a battery connected to the motor, a yoke attached to the motor drive unit and an elongate handle connected to the yoke for grasping while in use, the yoke having a locking mechanism cooperable between the yoke and drive unit, the locking mechanism having a plurality of locked positions, locking the motor drive unit in a plurality of positions.

[00010] Preferably, the yoke has yoke arms flanking the motor drive unit, and the locking mechanism is comprised of a locking ring attached to the motor drive unit, inside one of the yoke arms, and a selector knob cooperable with the locking ring and extending

through the yoke arm, the selector knob being rotatable between select positions whereby the knob can be locked to the locking ring and to the yoke arm. The cooperation between the selector knob, the locking ring and the yoke arm provides two locked positions and a floating position.

[00011] In yet another aspect of the invention, a battery powered apparatus and charging assembly, comprises a drive mechanism having a housing, a motor and a linkage to a drive member, the housing having a battery receiving cavity. A battery pack is receivable in the battery-receiving cavity, and is latchably attached within the cavity. A storage member for positioning on a wall is provided, having a hanging bracket for storing the unit, the storage member further comprising a charging unit which receives the battery pack in a charging configuration. In this manner the battery pack can be removed from the apparatus, the apparatus stored on the storage member, and the battery removed and placed in the charging unit.

[00012] Preferably, the charging unit is removable from the storage member.

BRIEF DESCRIPTION OF THE DRAWINGS

[00013] Figure 1 is a perspective view of the battery-powered washer with the brush oriented at an angle relative to the handle;

[00014] Figure 2 is a side view of the hand-held scrubber from the opposite side as that shown in Figure 1 showing the brush and handle in approximately parallel orientation;

[00015] Figure 3 is an exploded view of the major components of the subject invention;

[00016] Figure 4 is an exploded view of the motor drive unit of the subject invention;

[00017] Figure 5 shows an exploded view of the locking mechanism between the motor drive unit and handle;

[00018] Figure 6 shows an exploded view of the self-contained battery pack;

[00019] Figure 7 shows a length-wise cross-sectional view of the entire assembly;

[00020] Figure 8 shows an exploded view of the battery portion of Figure 7;

[00021] Figure 9 is a top plan view of the motor drive unit housing shown in Figure 5;

[00022] Figure 10 is a bottom plan view of the housing shown in Figure 9;

[00023] Figure 11 is a cross-sectional view through lines 11-11 of Figure 9;

[00024] Figure 12 is a cross-sectional view through lines 12-12 of Figure 9;

[00025] Figure 13 is a front plan view of the yoke which is used on the handle of the washer shown in Figure 1;

[00026] Figure 13A is a cross-sectional view through lines 13A-13A of Figure 13;

[00027] Figure 13B is a cross-sectional view through lines 13B-13B of Figure 13;

[00028] Figure 14 is a cross-sectional view through lines 14-14 of Figure 13B;

[00029] Figure 15 is a top plan view of the locking ring shown in Figure 5;

[00030] Figure 16 is a cross-sectional view through lines 16-16 of Figure 15;

[00031] Figure 17 is a side plan view of the locking ring of Figure 15;

[00032] Figure 18 is a top plan view of the locking selector knob shown in Figure 5;

[00033] Figure 19 is a cross-sectional view through lines 19-19 of Figure 18;

[00034] Figure 20 shows a side plan view of the battery housing;

[00035] Figure 21 shows a bottom plan view of the battery housing of Figure 20;

[00036] Figure 22 is a cross-sectional view through lines 22-22 of Figure 21;

[00037] Figure 23 is a side plan view of one of the batteries for the battery pack;

[00038] Figure 24 is an end plan view of the battery of Figure 23;

[00039] Figure 25 is a circuit schematic of the motor head;

[00040] Figure 26 is a circuit schematic for the battery pack;

[00041] Figure 27 is a perspective view showing the washer and battery pack in the storage cradle/recharger; and

[00042] Figure 28 shows an isometric view of the battery cradle and recharger of Figure 27.

[00043] Figures 29-31 show diagrammatical views of the detented position and operation of the torsionally spring loaded head.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[00044] As shown in Figures 1 and 2, the battery-powered washer of the present invention is shown generally at 2, and includes a motor drive unit 4, a battery pack 6, an attachment such as a brush 8, an elongate handle 10 attached to the motor drive unit 4 by way of a yoke 12, and a lock selector knob 14. As shown in Figure 3, the various components are shown exploded away from the motor drive unit 4, the brush 8 being shown unsnapped from the motor drive unit 4, the battery pack 6 being shown removed

from the upper portion of the motor drive unit 4, and the yoke 12 being shown removed from the motor drive unit 4.

[00045] With respect to Figures 4, 5, and 9 through 12, the motor drive unit 4 will be described in greater detail. With respect first to Figure 4, the entire motor drive unit 4 is shown in an exploded manner with the motor drive unit 4 generally including a motor housing 20, an electric DC motor 22, a gear casing 24, a double planetary gear set 26, a lower cover 28, and a drive lug 30. As shown in Figure 4, the motor housing 20 generally comprises a cylindrical housing portion 32 having an upper cylindrical portion 34 comprised of an inner surface 36 and an intermediate wall at 38. The inner surface 36 includes a plurality of lugs at 40 for locking the battery in place as will be described in further detail. As shown in Figure 4 and Figure 9, housing 20 includes an electrical contact pad at 42 which has a wire contact portion extending through the surface 38 for contact with the motor wiring as will be described herein.

[00046] With respect now to Figures 9 through 12, the housing 20 includes a lower opening at 48 to access an extension wall 50 projecting downwardly from upper wall 38. Extension wall 50 has an internal peripheral surface 52 having arcuate stop lugs 54 positioned thereon having stop surfaces at 56. Stop lugs 58 extend downwardly from the wall 38 and are positioned intermediate the stop lugs 54. Finally, as shown in Figure 4, housing 20 includes end flat sections 60 and 62 where section 60 includes a flat end surface 64 having a mounting post 66 extending therefrom and an arcuate rotational stop 68 having end stops at 70, 72 as described herein. As shown in Figures 3 and 11, end wall 62 includes a cylindrical mounting section 80 having a slot at 82, and diametrically opposed locking ribs 84 (only one of which can be viewed from Figure 11).

[00047] With respect now to Figure 4, the drive train of the motor drive unit 4 includes the motor 22, gear casing 24, and double planetary assembly 26. Motor 22 is a DC motor having an outer body portion 90, leads 92, and an output shaft 94. The gear casing 24 includes an inner opening at 100 having a plurality of protrusions 102 for retaining the electric motor 22 as described herein. The lower half of planetary housing 24 includes on the inner diameter thereof, planetary gear teeth 104 for cooperation with the planetary gear train 26.

[00048] The planetary gear train 26 is comprised of a triangular drive member 106 having upstanding drive posts 108 and a drive pinion 110 extending from the opposite side. Planetary gears 112 are positioned on each of the posts 108 (only one such planetary

gear at 112 shown) and pinion gear or sun gear 114 is driven by the output shaft 94 of the motor, with the pinion 114 being drivingly positioned in the center opening adjacent to the three planetary gears 112 and in driving connection therewith. Planetary gear assembly 26 further includes a drive member 116 having three upstanding posts 118 and an output drive shaft 120. Three planetary gears 122 are positioned over the posts and then receive between them output pinion 110 from the drive member 106.

[00049] As shown in Figure 4, lower cover 28 includes a receiving area at 130 and an opening 132 profiled to receive the drive shaft 120. Openings 134 align with threaded openings 49 in the housing 20 (Figure 10) for receipt of a fastener to retain the assembly together. Finally, drive member 30 includes an opening 140 profiled to cooperate with drive member 120, and further includes drive teeth 142. It should be appreciated to those skilled in the art that the drive member 30 is held to the drive shaft 120 by way of a spring clip or cotter pin, as is well known in the art.

[00050] With reference now to Figures 5 and 13 through 19, yoke 12 and the locking assembly 14 will be described in greater detail. The locking assembly 14 is comprised of a selector knob 150, a locking ring 152, and a compression spring 154. The knob assembly 14 cooperates with the locking lug 84 on housing 20, as well as with the yoke 12. With reference to Figures 13 and 14, the yoke is shown as including a socket portion 160 having yoke arms 162 and 164 extending therefrom. Yoke arm 164 includes a receiving end 165, while yoke arm 162 includes a cupped-shape portion 166 at a lower end thereof. The cupped-shape portion 166 has a recessed portion at 168, the recessed portion 168 having an inside diameter slightly greater than the outside diameter of member 80 on the housing 20. The cupped-shape portion 166 further includes an opening at 170 with a recessed section at 172 surrounding the perimeter of the opening 170, thereby forming lock lugs 174. Finally, an opening at 178 carries a set screw as will be described herein.

[00051] With respect now to Figures 13B and 14, the receiving end 165 is shown in greater detail. It should be understood in general that receiving end 165 is profiled to be received over post 66 and rotational stop 68 (Figure 4) and generally includes an annular channel at 165a having stops 165b and 165c. A cut-out section is formed in the molding of the yoke at 165d to extend downwardly and through wall section 165e forming an arcuate-shaped opening at 165f extending through to circular opening 165g. Thus, an arcuate opening 165f exists connecting annular channel 165a and annular opening 165g

for the length of the arcuate slot 165d. This arcuate slot 165d also forms an edge at 165h and at 165i as will be described herein. Finally, an opening 165j extending through wall 165e is centrally located relative to the receiving end 165.

[00052] With respect now to Figures 15 through 17, the locking ring 152 will be described in detail. The locking ring 152 includes an annular ring section 180 having projecting arms 182 which project outwardly from the annular ring section 180 and include on an outer surface thereof slots 184, which are profiled to be slidably receivable over the ribs 84 on housing 20. The annular ring 180 is further defined by cut-outs 186 positioned on one side of the arms 182, which extend deeply into the annular ring 180 as shown best in Figures 16 and 17. On the opposite side of the arms 182 are cut-outs 188 which are shallow as compared to cut-outs 186 as best shown in Figures 16 and 17.

[00053] With respect now to Figures 18 and 19, the selector knob 150 is shown as generally including an annular body portion 190 having a knob handle 192 for grasping and turning the knob as is generally known in the art. As shown in Figures 18 and 19, the selector 150 includes three locking feet 194 extending radially outwardly therefrom and have a width which is somewhat less than the width of either of the cut-outs 186 or 188. Furthermore, the outer diameter 196 of the ring 190 is profiled to be receivable within the diameter 181 of the annular ring 180. The annular ring 190 includes two pair of slots 198, 200 diametrically opposed from each other as described further herein. It should be recognized, however, that the width of the slots 198, 200 is profiled to be receivable over the lugs 174 shown in Figure 13A.

[00054] With reference now to Figures 6 and 20-22, the battery assembly will be described in greater detail. The battery assembly 6 is comprised of an upper housing portion 220 having a recess at 222 with a centrally located aperture at 224. The housing 220 has an outer annular wall portion 226 forming an internal cavity at 228. Receiving nests are formed by arcuate walls at 230 for receiving and locating batteries as described further herein. The housing 220 further includes an internal upper surface at 232 having locating slots at 234 and 236. The battery assembly 6 also includes a plunger assembly including a plunger rod 240 receivable through a compression spring 242 and a membrane seal 244 for positioning above the plunger 240, and a lock ring 246 for containing the assembly together, as more fully disclosed herein.

[00055] With respect now to Figures 6, 23 and 24, the individual battery member is shown at 250 including a rechargeable cell body at 252 and includes electrodes at 254 and

256 to provide the opposite polarity connections as is well known in the art. In the preferred embodiment of the invention, the batteries are comprised of nickel cadmium rechargeable batteries. With respect still to Figure 6, a lower platen 260 is shown having a plate portion 262 having stand-off legs at 264. The platen 260 includes arcuately shaped walls arranged in pairs such as pairs 266a, 266b, and 266c. It should be appreciated that these pairs of walls are arcuately configured to receive and position the battery member 250 in a predetermined position relative to the other batteries and to the battery assembly as further described herein.

[00056] With reference still to Figure 6, a switch member is shown at 270 including a switch body 272 and a switch contact at 274. The switch 270 further includes a plurality of electrical terminals 276 for the connection of individual wire conductors thereto for switching of electric power from the battery to the motor. In the preferred embodiment of the invention, the switch is operated by the pushing of the contact switch 274 and can operate between three positions, off, low power, and high power. With respect to Figures 6 and 8, the battery 6 further includes a lower housing portion 280 which is cooperable with the upper housing portion 220 to form a sealed enclosure. Such cooperation could be formed by ultrasonic welding or by adhesive fixing or other known means in the art. The lower housing portion 280 includes an internal cavity at 282 formed by an annular outer wall 284 and a floor at 286. The floor at 286 includes openings therethrough for contact tabs 288 which cooperate with the contacts 42 on the motor housing and further include wire contact portions at 290 for connection of the power from the batteries and switch as described herein. Finally, the battery portion includes an outer annular seal member 300 which is slidably receivable over the outer wall portion 284 to form a sealed connection with the motor drive unit 4 as further described herein. With the battered powered washer as described above, the assembly of the unit will now be described with respect to the various drawing figures.

[00057] With respect to Figure 4, the assembly of the motor drive unit 4 will be described in detail. The pinion gear 114 is first assembled to the output shaft 94 of the motor 22, and the assembled motor 22 is then inserted into the gear casing 24. As mentioned above, the motor 22 is held within the gear casing 24 by an interference fit between the outer surface 90 of the housing 22 and the projections 102 in the gear casing 24. The double planetary gear set is then assembled by positioning the planetary gears 122 over the individual posts 118 and then by placing the pinion gear 110 intermediate the

three assembled planetary gears 122. The planetary gears 112 are then assembled to their respective posts 108, and the assembly of the double planetary gear set 26 is then positioned inside of the gear casing 24 such that the first three planetary gears 112 are meshing with the gears 104, and then further inserted such that the planetary gears 122 mesh with the gears 104. Continued insertion of the double planetary gear set 26 will cause the pinion gear 114 to be drivingly positioned between the three planetary gears 112. When the double planetary gear set 26 is fully assembled as described above, the assembly of the motor 22, the gear casing 24, and the double planetary gear set 26 can be positioned within the housing 20, to a position where the motor 22 abuts the stand-offs 58 and the end of the gear casing 24 abuts the arcuate sections 54 (see Figure 7). At this position, lower cover 28 can be assembled to the housing 20 by allowing drive shaft 120 to project through opening 132, and by positioning fasteners through apertures 134 into housing openings 49 (Figure 10). The drive member 30 can then be assembled to the drive shaft 120 by way of a cotter pin or spring pin.

[00058] With respect now to Figures 5 and 13 through 19, the assembly of the locking mechanism 14 will now be described. The compression spring 154 is first inserted in the annular recess 202 and the locking ring 152 is then positioned over the selector knob 150 such that the feet 194 position themselves within the cut-outs 186. This assembly can then be positioned within the cylindrical member 80 such that the slots 184 are slidably received over ribs 84. The yoke 12 can then be assembled over the cylindrical portion 80 to a position where raised sections 174 are received in one of the slots 198, 200 on the knob 150. As shown in Figure 5, the yoke 12 includes indicia 179 showing a locked and unlocked position, which corresponds to locked and unlocked positions between the yoke and the housing 20. When the selector knob 150 is aligned such that knob portion 192 is aligned with the locked indicia, the feet 194 of knob 150 are received in cut-outs 186 of the locking ring 152. In this position, knob 150 is spring loaded to its fullest extent, outwardly of the retaining ring 152 such that one of the slots 198 or 200 engages with the projections 174 of the yoke member. To allow the motor drive unit 4 to swivel, the selector knob 150 is rotated to a position clock-wise where the locking feet 194 now reside within cut-outs 188. In this position, the selector knob 150 is spring loaded inwardly further towards surface 62 to a position where slots 198, 200 do not engage lugs 174, and thus yoke 12 is free to rotate relative to motor drive unit 4.

[00059] With reference to Figures 6 and 26, the assembly of the battery pack will be described. The switch 270 is mounted to the inner surface 286 of the lower housing portion 280 such that the switch member 274 is positioned at the center of opening 280. Platform 260 can then be positioned within the opening 282 such that switch member 274 extends upwardly through the center opening of plate 260. The individual batteries 280 can then be positioned between their respective arcuate walls 266a, 266b, and 266c and then wired to the switch. It should be appreciated that the individual batteries are connected to each other in series and then run through the switch for the switched connection. It should also be appreciated from Figure 26 that the battery member 6, will include three contact members, two of which will be for connection to the contacts 42 of the housing 20 and one for charging as to be described herein. In the preferred embodiment of the invention, the voltage variation is obtained by using a series of connected silicon rectifier diodes connected to the three-position switch that functions as off/low/high. The advantage of using the silicon rectifier diodes is that an almost constant voltage drop is obtained across the device (typically 0.7 volts), as compared to using a resistor which would have a varying voltage drop depending upon the motor load current.

[00060] With the batteries wired together and through the switch contact elements 276 and to the battery contacts 288a and 288b, the upper housing portion 220 can be assembled to the lower housing portion 280. In this respect, plunger 240 is positioned through the compression spring 242 and then into opening 224. The membrane 244 is then positioned over plunger 240 and locking ring 246 positioned in place. Once again, locking ring 246 could either be adhesively fixed within the recess 222 or could be ultrasonically bonded therein. The upper housing 220 is then fixed to the lower housing 280, again either adhesively or through ultrasonic welding. It should be appreciated then that the battery assembly 6 is a self-contained and sealed connection, as well as provides an integrated switch connection from the exterior of the battery pack by depressing membrane 244 activating plunger 240 which contacts switch contact 274. Thus, the battery pack can be alternatively advanced through the modes power off, low power, and high power from the exterior of the battery.

[00061] As described above, the battery is ready for installation within the motor drive unit 4 and the unit can be used. As shown in Figure 6, it should be appreciated that the battery lower housing 280 includes bayonet-style slots 285 for connection with the lugs 40 in Figure 11. It should be appreciated that when the battery 6 is positioned as

described above, contacts 288a and 288b of the battery contact corresponding contacts 42a and 42b of the motor drive unit. As shown in Figure 26, a separate and unswitched lead wire extends between a third contact of the battery 288c directly to the batteries for charging purposes.

[00062] In that regard, and with reference to Figures 27 and 28, a combination storage cradle and charging unit is shown generally at 300 which is comprised of a cradle member 302 and a charging unit 304. As shown in Figure 28, the cradle 302 includes upper cradle hangers 306 which flank a central slot 308. Thus, it should be appreciated that the cradle 302 can be positioned adjacent to a wall, for example, a wall within a garage, and can be fixed in place by apertures extending through openings 310 of the cradled 302. This allows the battery-powered washer 2 to be hung in place as depicted in Figure 27. A removable battery recharger 304 is positionable and receivable within an opening 312 of the cradle 302 and in turn has a power cable 314 for connection to an AC voltage source for recharging. The recharger thus has recharging contact members at 320 which contact the contact elements 288b and 288c of the battery pack 6. Thus, as mentioned, the cradle 300 can be positioned against a wall and the battery 6 can be recharged while the unit is hanging. Alternatively, the user can have an extra rechargeable battery 6 and can leave one of the batteries fixed to the motor drive unit 4 and always have a recharged battery 6 in the recharger unit. It is anticipated that the charger 300 is of the type that recharges the battery to its full capacity, and thereafter is automatically shut off to not further draw power. It is anticipated that the charging unit 304 has an LED readout at 322, which indicates when the unit is charging. However, advantageously, the charging unit 304 is removable from the cradle 302 in the event that the user wishes to use the unit elsewhere and will require the battery charging unit. Although not specifically shown, it is anticipated that the cradle 302 will have a mounting lug extending from side wall 314 which is of a similar profile to that drive lug 30 and extends outwardly such that an alternate brush 8 can be held in place to the cradle.

[00063] Thus, it is anticipated that the battery-powered washer is usable in many household cleaning tasks, probably most usable for such items as washing an automobile and thus two brush configurations are included, that is, configurations 8a and 8b, where a first brush 8a is usable for the body, hood, and roof of an automobile, and where a brush such as 8b would be usable for areas such as cleaning the wheels or grill of the automobile. Advantageously, the motor drive unit has three different positions relative to

the yoke in which it can operate, that is, the selector knob can be placed in two locked positions in which case the motor drive unit has two locked positions relative to the yoke, and one position where the head is free to pivot. It is anticipated that the two locked positions would be angular orientations of the motor drive unit relative to the yoke such that in one position, the hand-held unit could be held with the head down for access to the wheels of the automobile and in another locked position, the unit could be held somewhat horizontally by the elongate handle 10 for washing the sidewalls of an automobile.

[00064] With respect now to Figures 29 through 31, the unlocked position will be described in greater detail, and in particular to the spring-loaded effect of the yoke 12 and head 4. As shown first in Figure 29, the yoke portion 165 is positioned over the rotational stop 68 such that the rotational stop member 68 is received within the annular opening 165a (Figure B). This also places the post 66, which extends from surface 64 of the head 4, through aperture 165j of the receiving end 165. A torsional spring 340 having a central wound section 342 is positioned over the post 66 with spring legs 344 and 346 extending therefrom. As shown in Figure 29, in the neutral position, the opening 165d is shown such that the arcuate length of the opening 165d, and therefore the arcuate length of the opening 165f is the same as the distance between end surfaces 70 and 72 of the radial stop member 68. It should be realized that in this view, and in the views of Figures 30 and 31, the stop surfaces 70 through 73 cannot actually be seen, but rather are shown for diagrammatical purposes as it relates to their function with the torsion spring 340.

[00065] Thus, in the equilibrium position of Figure 29, the torsion arm 344 extends from the wound section 342 radially outward through opening 165f and into the annular channel 165a. Thus, in the neutral position, torsion spring arm 344 extends through opening 165d and is torsionally held against stop member 70, while torsion arm 346 extends through the opening 165d and extends into annular channel 165a to abut stop surface 72. It should be appreciated that in this position, the torsion spring arm 44 also abuts edge 165j, whereas torsion spring arm 346 abuts edge 165i (Figure 13B).

[00066] When the arm 164 is moved clockwise relative to head 4 as shown in Figure 30, stop surface 70 will rotate away from torsion spring arm 344, but the spring arm 344 will remain against the stop edge 165h, preventing the rotation of spring arm 344 relative to the yoke 12, however, surface 72 carries spring arm 346 in the counter-clockwise position as viewed in Figure 30 away from the edge 165i.

[00067] Finally, with respect to Figure 31, if yoke arm 164 is moved in the counter-clockwise position relative to the head as shown in Figure 31, the opposite reaction occurs where stop surface 72 is rotated away from the spring arm 346 yet the spring arm 346 is retained by edge 165i. Rather the stop surface 70 carries spring arm 344 in the clockwise sense as viewed in Figure 31. Thus, in either of the positions of Figure 30 or Figure 31, the head is floatable between the position where stop surface 73 abuts stop lug 165b (Figure 31) and between the position where a stop surface 71 abuts stop lug 165c (Figure 30). In either of these positions, the torsion spring is torsionally compressed (comparing torsion spring 340 in either of Figures 30 or 31 with that of Figure 29), and thus the head is spring-loaded back to the position of Figure 29.

[00068] Advantageously then the battery-powered washer as described herein has several advantages. Firstly, the battery pack 6 is comprised of a plurality of self-contained and self-sealed batteries where the battery pack is insertable and removable from the washer head for operation or for recharging. It is also the seal itself on the battery pack which seals the internal components of the motor drive unit, and in particular the contact elements 42. Furthermore, the battery pack is self-contained and includes an integral switch for switching directly from the batteries to the motor drive unit, such that a discreet switch, and the required wiring are not included to complicate the assembly. Furthermore, the device is quite useful as it contains two separate locking positions, as well as a free-floating position whereby the head is held in a detented position, but the head is moved between two extremes, but is spring-loaded back to its equilibrium position. Finally, the combination of storage hanger and recharger allows for the unit to be stored and at the same time to have the battery recharged.